

## High Voltage Die Comparison ( $V_{t@250\mu A} = 5mA$ , $V_{bd} = 250uA$ , $td(on) = td(off)$ , $tf = V_{dd} = 50V$ )

	td(on) min	td(on) avg	td(on) stddev	td(on) max	tr min	tr avg	tr stddev	tr max	td(off) min	td(off) avg	td(off) max	td(dev)
37.000	42.100	44.000	2.378	78.000	89.400	95.000	4.648	190.000	199.000	214.000	214.000	7.257
45.000	46.783	49.000	0.998	21.000	25.435	29.000	1.674	350.000	362.478	375.000	375.000	5.846
45.000	46.652	50.000	1.369	19.000	24.391	29.000	3.011	360.000	367.826	380.000	380.000	5.167

	<b>tf min</b>	<b>tf avg</b>	<b>tf max</b>	<b>tf stddev</b>	<b>Vf(10ma) min</b>	<b>Vf(10ma) avg</b>	<b>Vf(10ma) max</b>	<b>Vf(10ma) stddev</b>	<b>Vf(100ma) min</b>	<b>Vf(100ma) avg</b>
118.000	125.200	137.000	6.106	0.623	0.629	0.634	0.634	0.003	0.800	0.804
57.000	65.870	76.000	4.192	0.626	0.629	0.634	0.634	0.002	1.010	1.037
49.000	61.304	68.000	4.128	0.623	0.628	0.652	0.652	0.006	1.000	1.032

**Vf(100ma) max**    **Vf(100ma) stddev**  
0.810                    0.005

1.060	0.017
1.180	0.036

## Lot

## Device IR

Part ID	Vt	Rdson (5ma)	Rdson (10ma)	Vbd(250ua)	td(on)	tr	td(off)	tf
8A	3.683	9.2	9	1135				
9A	3.6279	9.2	9.1	1135				
10A	3.7369	9.2	9					
1					44	88	200	120
2					44	90	190	130
3					42	90	192	131
4					40	95	200	121
5					40	78	214	128
6					43	88	190	125
7					37	88	198	137
8					43	92	204	118
9					44	92	200	121
10					44	93	202	121
MIN	3.6279	9.2	9	1135	37	78	190	118
AVG	3.6826	9.2	9.033333333	1135	42.1	89.4	199	125.2
MAX	3.7369	9.2	9.1	1135	44	95	214	137
STDEV	0.054501101	0	0.057735027	0	2.378141	4.64758	7.25718	6.106463

Vf(10ma) Vf(100ma)

0.6271	0.8
0.6265	0.8
0.6267	0.8
0.6285	0.8
0.6261	0.8
0.6316	0.81
0.6234	0.8
0.6306	0.81
0.6342	0.81
0.6306	0.81
0.6234	0.8
0.62853	0.804
0.6342	0.81
0.003195	0.005164

## TCBM Lot 9088R Wafers 5 &amp; 8

## Device A1

Part ID	Vt	Rdson (5ma)	Vbd(250ua)
1	2.756	18	1235
2	2.7607	17.6	1245
3	2.766	16	1205
4	2.7654	16.2	1210
5	2.7469	17.6	1245
6	2.7679	18.2	1240
7	2.766	17.8	1235
8	2.7701	17.6	1240
9	2.7658	16.6	1215
10	2.7807	17.8	
11	2.7582	18	1250
12	2.7645	17.6	1240
13	2.7642	17.8	1240
14	2.7728	18	1240
15	2.7602	18	1245
16	2.7467	17.6	1245
17	2.7445	17.2	1230
18	2.7742	17.6	1245
19	2.7734	18	1250
20	2.7476	17.8	1235
21	2.764	17.6	1240
22	2.7511	16.8	1230
23	2.7751	15.6	1185
24	2.7544	16.6	1230
25	2.7667	17.6	1240
26	2.7721	18.2	1245
27	2.7697	17.6	1245
28	2.7809	18.2	1250
29	2.7638	17.6	1250
30	2.7732	18	1250
MIN	2.7445	15.6	1185
AVG	2.764093333	17.493333333	1236.3793
MAX	2.7809	18.2	1250
STDEV	0.009888549	0.674119264	15.171434

## TCBM Lot 9088R Wafers 5 &amp; 8

## Device B1

Part ID	Vt	Rdson (5ma)	Rdson (10ma)	Vbd(250ua)
1	2.771	19.2	19.2	1225
2	2.7739	19.2	19.4	1225
3	2.7729	18	18.3	1250
4	2.7679	18	18.4	1245
5	2.77	18.2	18.4	1250
6	2.7679	19	19	1235
7	2.782	18.6	18.7	1245
8	2.788	22	21.4	1195
9	2.7729	18.6	18.7	1235
10	2.7889	18.6	18.7	1255
11	2.7799	18.2	18.3	1240
12	2.77	18.4	18.5	1240
13	2.786	18.4	18.5	1250
14	2.7639	17.6	17.8	995
15	2.767	18.2	18.5	1250
16	2.7799	18.4	18.6	1240
17	2.783	18.4	18.5	1245
18	2.776	18.6	18.5	1240
19	2.7539	25.4	24.4	1220
20	2.7689	18.4	18.4	1250
21	2.772	17.8	18.1	
22	2.7639	18.2	18.2	1245
23	2.7799	18.4	18.4	1245
24	2.772	18	18.2	1245
25	2.8059	19	18.5	1115
26	2.752	19.4	19.5	1245
27	2.783	18.4	18.6	1250
28	2.77	18.2	18.3	1240
29	2.779	18.4	18.6	1250
30	2.776	17.8	18	1270
MIN	2.752	17.6	17.8	995
AVG	2.774586667	18.766666667	18.82	1228.7931
MAX	2.8059	25.4	24.4	1270
STDEV	0.010572597	1.475392019	1.232994672	52.41754

## TCBM Lot 9088R Wafers 5 &amp; 8

## Device B2

Part ID	Vt	Rdson (5ma)	Rdson (10ma)	Vbd(250ua)
1	2.76	19	18.9	1130
2	2.7799	18.4	18.5	1160
3	2.7469	20.6	20.6	1135
4	2.7799	18.2	18.4	1155
5	2.793	19.8	19.4	1110
6	2.7589	17.2	17.3	1140
7	2.781	18	18.3	1155
8	2.765	18.2	18.3	1145
9	2.7679	17.8	17.9	1155
10	2.757	18.4	18.5	1140
11	2.7679	18.4	18.8	1155
12	2.756	17.6	17.6	1150
13	2.761	18.4	18.6	1125
14	2.755	17.4	17.6	1145
15	2.776	18.6	18.8	1150
16	2.7679	17.8	18.1	1150
17	2.777	18.2	18.3	1150
18	2.7679	17.8	18	1155
19	2.7479	19.2	19.4	1145
20	2.7789	17.8	17.9	1150
21				
22	2.7639	17.6	17.7	1140
23	2.7679	17.6	18	1150
24	2.7679	18.2	18.2	1150
25	2.761	18.2	18.2	1145
26	2.7639	18.4	18.4	1145
27	2.772	18.2	18.3	1155
28	2.7799	18.2	18.5	1155
29	2.777	18.2	18.5	1150
30				
MIN	2.7469	17.2	17.3	1110
AVG	2.767803571	18.26428571	18.39285714	1146.0714
MAX	2.793	20.6	20.6	1160
STDEV	0.010799982	0.70983268	0.65258947	10.745985

## TCBM Lot 9088R Wafers 5 &amp; 8

Device B3

Part ID	Vt	Rdson (5ma)	Rdson (10ma)	Vbd(250ua)
1	2.752	15.8	16	1070
2	2.783	15.6	16	1075
3	2.7799	16	16.4	1080
4	2.767	15.8	15.9	1075
5	2.7639	15.2	15.5	1085
6	2.749	15.8	16	1075
7	2.762	15.2	15.3	1075
8	2.781	16.2	16.4	1070
9	2.76	15.2	15.5	1075
10	2.787	16	16.2	1065
11				
12	2.786	16.2	16.3	1075
13	2.762	16	16.1	1065
14	2.76	16	16	1070
15	2.76	15.2	15.2	1085
16	2.761	16.2	16.2	1080
17	2.775	16	16.2	1075
18	2.7589	16	16.1	1065
19	2.7579	15.6	15.7	1075
20	2.76	15.6	15.5	1075
21	2.7589	15.4	15.5	1080
22	2.746	15.4	15.5	1065
23	2.762	15.6	15.5	1075
24	2.7589	15.4	15.3	1080
25	2.7469	15.6	15.7	1060
26	2.757	15.6	15.5	1080
27	2.778	16	16.3	1070
28	2.7629	16	16	1065
29	2.779	16.2	16.4	1060
30	2.7679	15.4	15.4	1080
MIN	2.746	15.2	15.2	1060
AVG	2.764934483	15.73103448	15.84827586	1073.2759
MAX	2.787	16.2	16.4	1085
STDEV	0.011483786	0.334987685	0.380432733	6.8499038

## TCBM Lot 9088R Wafers 5 &amp; 8

## Device B4

Part ID	Vt	Rdson (5ma)	Vbd(250ua)
1	2.7739	17.4	915
2	2.7978	18.2	910
3	2.7651	18.8	915
4	2.7656	18.8	920
5	2.75	18.4	920
6	2.7652	18.8	915
7	2.7555	18.4	910
8	2.7838	17.6	910
9	2.7485	18.4	915
10	2.7663	18.4	925
11	2.7607	17.6	910
12	2.7688	19	915
13	2.7542	18.4	920
14	2.7571	18	915
15	2.7465	19.2	915
16	2.7507	18.4	920
17	2.7365	21	910
18	2.7458	19.2	920
19	2.7389	19	915
20			
21	2.7784	17.6	910
22	2.7519	18.6	915
23	2.7527	18.6	920
24	2.7544	18.4	915
25	2.7689	18.6	925
26	2.7946	18.4	915
27	2.7764	18.4	910
28	2.7587	18	910
29	2.7555	18.4	920
30	2.7504	19.2	915
MIN	2.7365	17.4	910
AVG	2.761131034	18.52413793	915.51724
MAX	2.7978	21	925
STDEV	0.014957156	0.676997137	4.5009578

## TCBM Lot 9088R Wafers 5 &amp; 8

Device B5

Part ID	Vt	Rdson (5ma)	Vbd(250ua)
1	2.7658	18.2	1220
2	2.7465	18.8	
3	2.789	18.2	1155
4	2.7647	18	1210
5	2.7642	18.2	1220
6	2.7662	17.6	1200
7	2.7742	18.4	1220
8			
9	2.808	18.4	1095
10	2.7882	18.4	1215
11	2.8011	18	1125
12	2.7631	17.8	1210
13	2.7681	19.4	1220
14	2.7701	18.6	1230
15	2.7677	18.6	1225
16	2.7733	19.2	1220
17	2.7881	18.2	1210
18	2.7849	18.2	1210
19	2.7858	17.6	1190
20	2.7876	17.4	1190
21	2.7807	18.4	1200
22	2.7742	20.2	1200
23	2.7701	20	1215
24	2.762	19.2	1205
25	2.7748	17.4	1190
26	2.7681	18.6	1230
27	2.7754	18.4	1215
28	2.7717	18.8	1220
29	2.7789	18.6	1225
30	2.7627	19.8	1215
MIN	2.7465	17.4	1095
AVG	2.775006897	18.50344828	1202.8571
MAX	2.808	20.2	1230
STDEV	0.012822857	0.716381163	30.744725

## TCBM Lot 9088R Wafers 5 &amp; 8

## Device C1

Part ID	Vt	Rdson (5ma)	Rdson (10ma)	Vbd(250ua)	td(on)	tr	td(off)	tf
1	2.7354	11	10.9	1090				
2	2.7476	10.6	10.6	1075				
3	2.7523	11.2	10.9	1055				
4	2.7505	11.2	11	1065	46	27	366	63
5	2.732	10.8	10.8	1075	46	21	366	67
6	2.7584	10.8	10.8	1065	47	29	354	68
7	2.7524	10.4	10.5	1075	48	25	362	67
8	2.7525	11	10.8	1060	47	26	362	65
9	2.7524	10.8	10.8	1055	45	25	361	69
10	2.7549	10.4	10.5	1075	48	26	363	68
11	2.7524	11.6	11.5	1080	45	26	362	67
12								
13	2.762	10.4	10.4	1070	49	23	366	71
14	2.7302	10.8	10.8	1085	46	26	355	69
15	2.769	11	10.9	1065	47	24	354	69
16	2.7427	10.6	10.7	1070	46	24	368	67
17								
18	2.7593	10.8	10.7	1060	47	27	367	57
19	2.7589	11	10.8	1060	47	26	365	65
20	2.7504	10.8	10.7	1070	47	26	365	62
21	2.7589	11.2	11.2	1060	47	24	360	62
22	2.7789	11	10.9	1055	47	24	354	68
23	2.7551	10.8	10.6	1070	46	27	368	65
24	2.7633	11	10.8	1070	46	25	367	62
25	2.7431	11	11	1080	47	27	365	68
26	2.7617	10.8	10.7	1065	48	25	362	61
27	2.7321	10.8	10.8	1080	46	27	375	59
28	2.7349	10.8	10.8	1085	48	25	350	76
29	2.7723	11.2	11.1					
30	2.7758	11.6	11.6					
MIN	2.7302	10.4	10.4	1055	45	21	350	57
AVG	2.753193	10.90714286	10.84285714	1069.8077	46.78261	25.43478	362.4783	65.86957
MAX	2.7789	11.6	11.6	1090	49	29	375	76
STDEV	0.012925	0.300528635	0.265871831	9.846905	0.998022	1.674029	5.845508	4.192031

Vf(10ma) Vf(100ma)

0.6286	1.04
0.6273	1.02
0.6309	1.06
0.6286	1.02
0.6318	1.06
0.633	1.06
0.6267	1.02
0.6343	1.06
0.6271	1.01
0.6282	1.03
0.6274	1.04
0.6292	1.03
0.6264	1.02
0.6282	1.04
0.6261	1.02
0.6332	1.06
0.63	1.05
0.6288	1.05
0.6288	1.06
0.6291	1.04
0.6261	1.03
0.6265	1.02
0.6264	1.02
0.6261	1.01
0.628813	1.037391
0.6343	1.06
0.002394	0.017114

## TCBM Lot 9088R Wafers 5 &amp; 8

## Device C3

Part ID	Vt	Rdson (5ma)	Rdson (10ma)	Vbd(250ua)	td(on)	tr	td(off)	tf
1	2.7539	10.8	10.6	1060				
2	2.76	10.8	10.7	1065				
3	2.76	11	10.8	1065				
4	2.7479	11.8	11.6	1060				
5	2.771	10.8	10.8	1060	45	24	366	57
6	2.7529	10.8	10.6	1055	45	29	369	60
7	2.744	10.6	10.5	1070	46	25	365	66
8	2.76	10.8	10.7	1070	47	22	361	64
9	2.7729	10.6	10.5	1060	45	26	365	62
10	2.7629	11	10.8	1060	46	29	363	62
11	2.77	10.6	10.5	1065	47	27	369	60
12	2.749	10.8	10.7	1075	45	24	366	68
13	2.745	11	10.8	1070	47	21	367	67
14	2.745	11	10.8	1065	46	20	363	64
15	2.75	11	10.7	1075	48	19	372	59
16	2.755	11	10.8	1055	47	23	380	49
17	2.756	13.6	13.4	1060	45	22	375	63
18	2.7579	11.2	10.9	1055	50	25	364	64
19	2.745	11.2	11.2	1055	46	26	368	63
20	2.796	11.2	10.9	1045	46	25	364	61
21	2.757	11.2	10.8	1070	46	29	375	58
22	2.7479	11.2	10.9	1070	47	25	370	61
23	2.767	11.2	11.1	1050	48	25	367	59
24	2.7729	11	10.7	1060	48	19	360	61
25	2.7579	11	10.8	1070	49	22	364	66
26	2.744	11	10.8	1065	48	27	377	56
27	2.7469	10.8	10.6	1060				
28	2.756	10.8	10.7	1070				
29	2.7539	10.8	10.5	1055	46	27	370	60
30	2.7629	10.6	10.7	1060				
MIN	2.744	10.6	10.5	1045	45	19	360	49
AVG	2.75736	11.04	10.863333333	1062.5	46.65217	24.3913	367.8261	61.30435
MAX	2.796	13.6	13.4	1075	50	29	380	68
STDEV	0.0114148	0.544312284	0.528813463	7.2812939	1.368765	3.011178	5.166784	4.127896

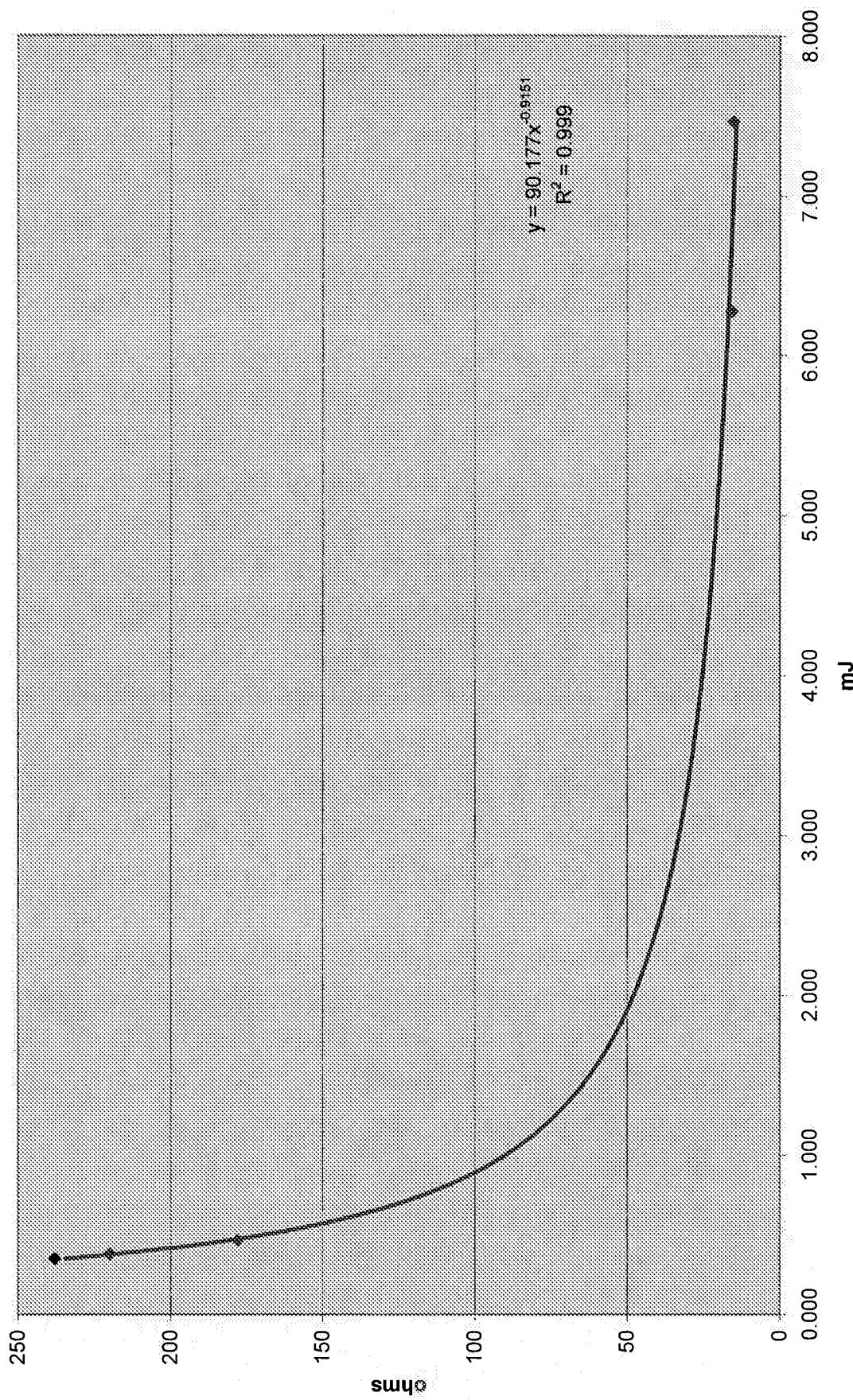
Vf(10ma) Vf(100ma)

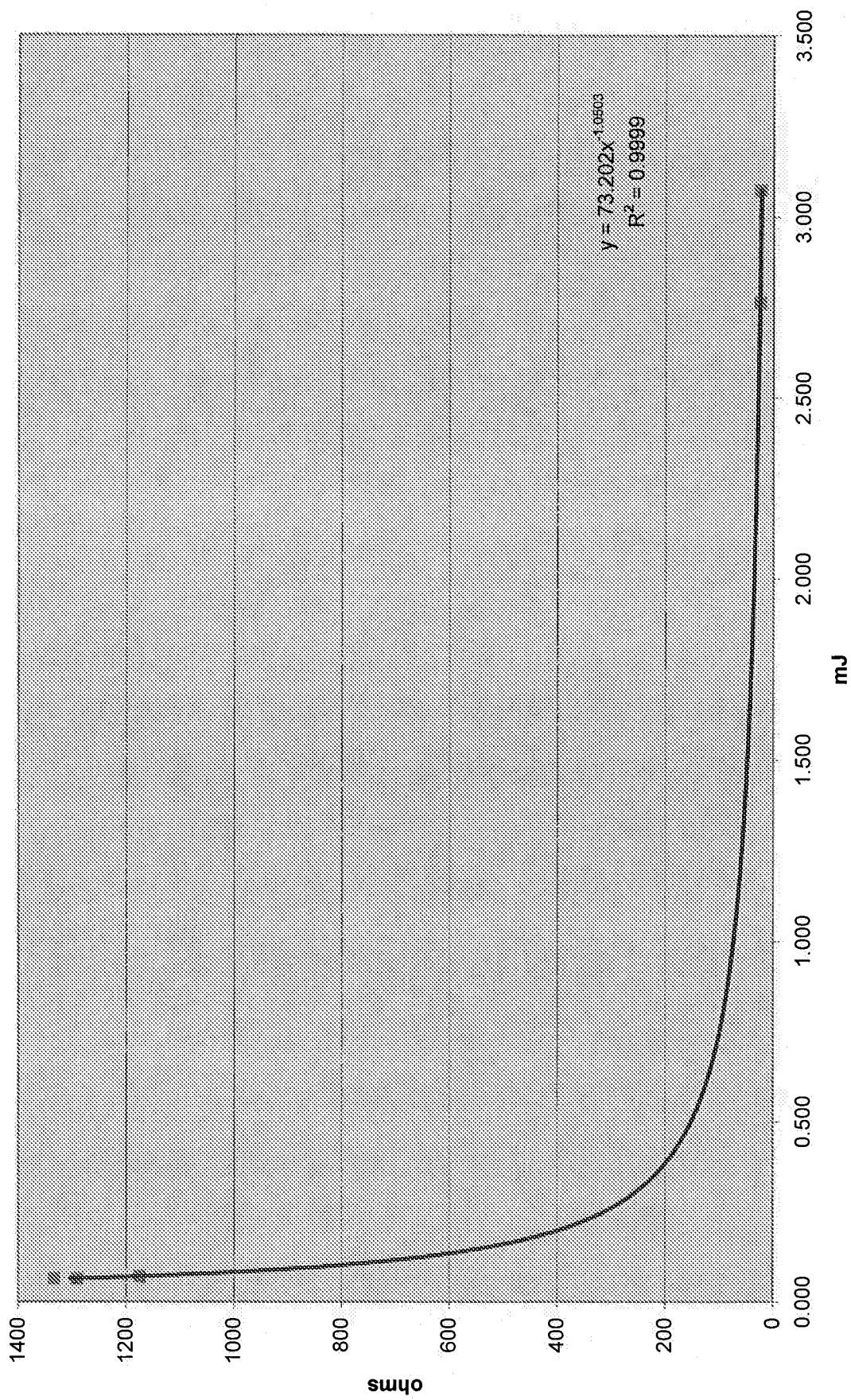
0.6268	1.03
0.6285	1.04
0.6245	1
0.6274	1.03
0.6258	1
0.6268	1.03
0.6233	1
0.6274	1.03
0.627	1.03
0.6234	1.02
0.6228	1.01
0.627	1.04
0.652	1.18
0.6268	1.03
0.6276	1.03
0.6304	1.07
0.6268	1.03
0.6274	1.03
0.6294	1.03
0.6277	1.01
0.6273	1.02
0.6278	1.02

0.6265 1.03

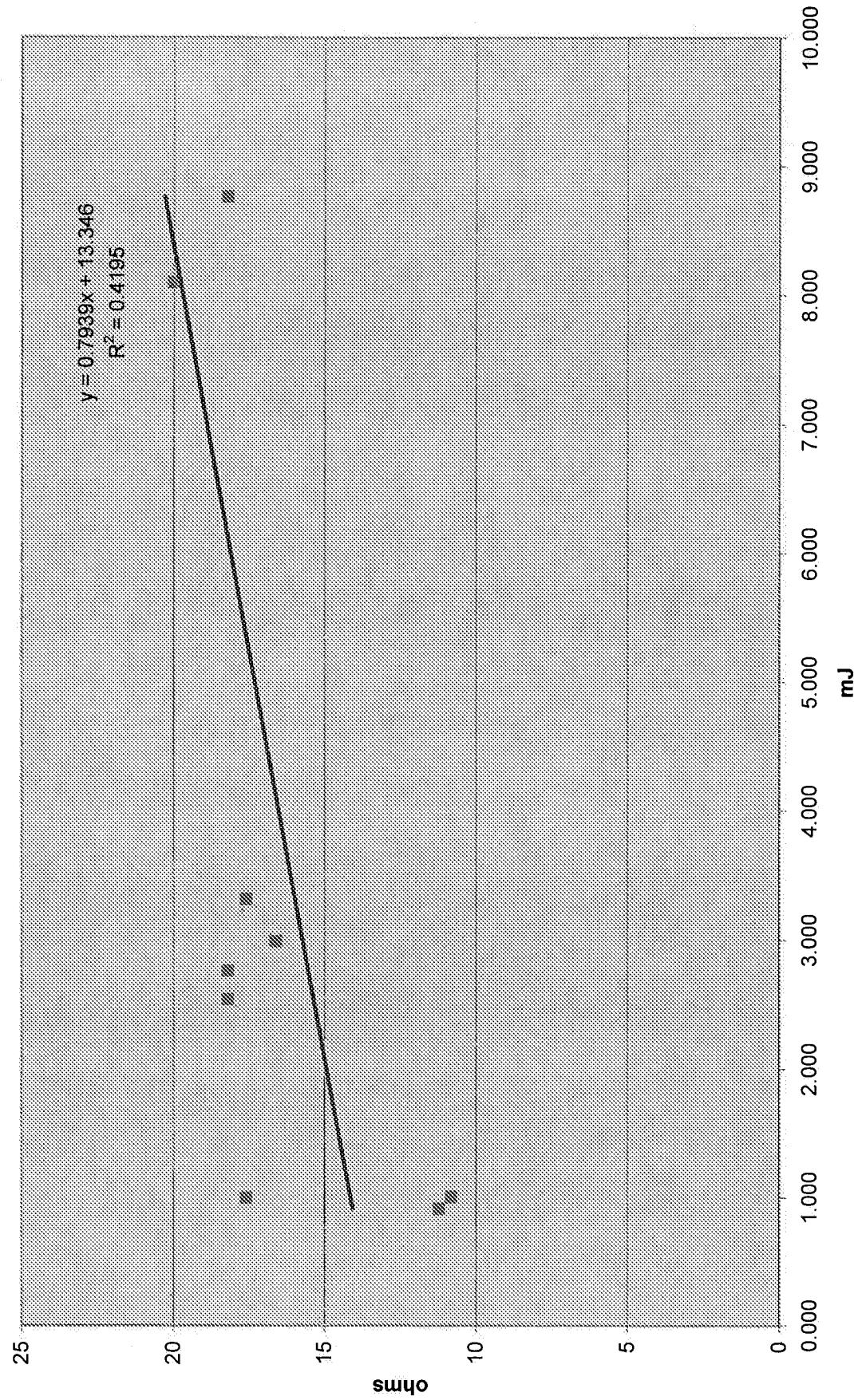
0.6228	1
0.627843	1.032174
0.652	1.18
0.00557	0.03567

$R_{dson}$  vs  $E_{as}$  ( $V_t$ : 8V)





R<sub>dson</sub> vs E<sub>as</sub> (Vt: 2.7V)



## Unclamped Inductive Switching Test Results

### Constants

Vdd 50

L 0.01

$$E=0.5*Io^2*L*(Vbdeff-(Vbdeff-Vdd))$$

Die	Pulse Width(s)	Io(mV)	Io(A)	Vbdeff(V)	E(mJ)
D360.1	0.0001	0.023	0.23	1240	0.276
	0.0002	0.08	0.8	1240	3.334
	0.0003	0.116	1.16	1260	7.006
	0.0004	0.14	1.4	1260	10.205
	0.0005	0.162	1.62	1260	13.664
	0.0006	0.18	1.8	1270	16.864
	0.0007	0.2	2	1270	20.820
	0.0008	0.212	2.12	1270	23.393
	0.0009	0.23	2.3	1270	27.534
	0.0010	0.235	2.35	1275	28.740
D360.2	0.0001	0.046	0.46	1210	1.104
	0.0002	0.086	0.86	1230	3.855
	0.0003	0.115	1.15	1240	6.890
	0.0004	0.14	1.4	1240	10.212
	0.0005	0.17	1.7	1280	15.037
	0.0006	0.185	1.85	1280	17.808
	0.0007	0.21	2.1	1280	22.946
	0.0008	0.22	2.2	1310	25.160
	0.0009	0.23	2.3	1320	27.491
	0.0010	0.24	2.4	1320	29.934
D360.3	0.0001	0.046	0.46	1240	1.102
	0.0002	0.084	0.84	1260	3.674
	0.0003	0.116	1.16	1300	6.997
	0.0004	0.14	1.4	1300	10.192
	0.0005	0.17	1.7	1320	15.019
	0.0006	0.19	1.9	1320	18.761
	0.0007	0.2	2	1320	20.787
	0.0008	0.22	2.2	1330	25.145
	0.0009	0.23	2.3	1330	27.483
	0.0010	0.235	2.35	1360	28.666

High Vt Die Io (V)

C1.2	0.00003	0.0096	0.096	1080	0.048	A1.10	0.03
	0.00004	0.019	0.19	1200	0.188	B1.10	0.027
	0.00005	0.023	0.23	1200	0.276	B3.10	0.026
	0.00006	0.027	0.27	1200	0.380	C1.10	0.11
	0.00007	0.032	0.32	1240	0.534	C3.10	0.12
	0.00008	0.036	0.36	1240	0.675		
	0.00009	0.04	0.4	1240	0.834	A1.15	0.0115
	0.00010	part blew up			0.000	B1.15	0.011
						B3.15	0.011
C1.3	0.00003	0.014	0.14	1040	0.103	C1.15	0.077
	0.00004	0.018	0.18	1200	0.169	C3.15	0.073
	0.00005	0.022	0.22	1200	0.253		
	0.00006	0.027	0.27	1200	0.380	A1.24	0.076
	0.00007	0.031	0.31	1200	0.501	A1.25	0.08
	0.00008	0.035	0.35	1200	0.639	A1.26	0.073
	0.00009	0.04	0.4	1200	0.835	A1.27	0.044
	0.00010	0.042	0.42	1200	0.920	A1.28	0.07
						B5.23	0.125
C3.1	0.00003	0.014	0.14	1040	0.103	B2.29	0.13
	0.00004	0.019	0.19	1200	0.188	C1.3	0.042
	0.00005	0.023	0.23	1200	0.276	C3.1	0.044
	0.00006	0.027	0.27	1200	0.380	C3.2	0.044
	0.00007	0.031	0.31	1200	0.501		
	0.00008	0.035	0.35	1200	0.639		
	0.00009	0.04	0.4	1200	0.835		
	0.00010	0.044	0.44	1200	1.010		
C3.2	0.00003	0.014	0.14	1040	0.103		
	0.00004	0.019	0.19	1080	0.189		
	0.00005	0.022	0.22	1100	0.254		
	0.00006	0.028	0.28	1180	0.409		
	0.00007	0.031	0.31	1180	0.502		
	0.00008	0.036	0.36	1180	0.677		
	0.00009	0.04	0.4	1180	0.835		
	0.00010	0.044	0.44	1180	1.011		
B5.23	1.00E-03	0.125	1.25	1400	8.102		
B2.29	1.50E-03	0.13	1.3	1400	8.763		
A1.24	2.00E-04	0.076	0.76	1400	2.995		
A1.25	2.25E-04	0.08	0.8	1400	3.319		
A1.26	2.00E-04	0.073	0.73	1400	2.763		
A1.27	1.00E-04	0.044	0.44	1400	1.004		
A1.28	2.00E-04	0.07	0.7	1400	2.541		
Avg					2.524		

$I_o$  (A)       $V_{eff}$        $E_{as}$  (mJ)       $V_t$        $R_{dson}$        $V_{bd}$

0.3	1400	0.467	7.93	178	1076
0.27	1275	0.379	7.93	220	1090
0.26	1275	0.352	7.95	238	942
1.1	1400	6.274	7.88	15.8	1042
1.2	1400	7.467	7.88	15.2	960
0.115	840	0.070	9.95	1175	1050
0.11	800	0.065	10.1	1333	1058
0.11	810	0.064	10.1	1290	922
0.77	1400	3.074	9.92	23.2	1050
0.73	1400	2.763	9.92	24.4	936
0.76	1400	2.995	2.7544	16.6	1230
0.8	1400	3.319	2.7667	17.6	1240
0.73	1400	2.763	2.7721	18.2	1245
0.44	1400	1.004	2.7697	17.6	1245
0.7	1400	2.541	2.7809	18.2	1250
1.25	1400	8.102	2.7701	20	1215
1.3	1400	8.763	2.777	18.2	1150
0.42	1200	0.920	2.7523	11.2	1055
0.44	1200	1.010	2.7539	10.8	1060
0.44	1180	1.011	2.76	10.8	1065

Device	250ua	500ua	1ma	R (250ua-500ua)	R (500ua-1ma)	R (250ua-1ma)
C1.6	1078	1096	1134	72000.00	76000.00	62222.22
C1.17	1074	1092	1128	72000.00	72000.00	60000.00
C1.25	1088	1106	1142	72000.00	72000.00	60000.00
C3.7	1074	1082	1094	32000.00	24000.00	22222.22
C3.11	1068	1074	1088	24000.00	28000.00	22222.22
C3.14	1074	1080	1094	24000.00	28000.00	22222.22
D360.1	1166	1170	1174	16000.00	8000.00	8888.89
D360.4	1168	1172	1176	16000.00	8000.00	8888.89
D360.8	1168	1172	1176	16000.00	8000.00	8888.89

Lot 9088R

	D1	D2	D3
PD1	650	1000	635
PD2	650	1000	622
PD3	654	996	605
PD4	658	994	606
PD5	656	1000	604
PD6	650	1002	604
PD7	652	1006	614
PD8	654	1000	594
PD9	654	1002	610
PD10	652	1000	608
MIN	650	994	594
AVG	653	1000	610.2
MAX	658	1006	635

TCBM Lot 9088R Wafers 5 & 8						
Device	Vt	Rdson (5ma)	Rdson (10ma)	Vbd (250ua)	I(V)	Veff
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
MIN		0	0	0		
AVG	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		
MAX		0	0	0		
STDEV	#DIV/0!	#DIV/0!	#DIV/0!			